

writes Mr. Millais, as the results of close observation, "between June 15 and October 10, undergo a *double moult*, that is to say, the feathers are actually shed twice, whilst one-third (viz. the long scapulars, wings, tail and back feathers) are renewed only once, and during all the time, both in the shedding of the old feathers and the assumption of the new, there is a process of constant sympathetic change of colour."

Mr. Millais has something even more strange to tell.

"I am convinced," he writes, "that a bird has full power to command the moult as it will, and also"—stranger still—"to infuse or withhold colouring matter as it thinks necessary."

The Lord of creation "cannot make one hair black or white."

His conclusions, startling as they may be, are those of a thoughtful and observant man who has conscientiously devoted many years to a close study of a fascinating subject.

It is not, as a rule, until the drake has completely assumed the duck's brown dress, harmonising as it does with the colour of the dying reeds, that the quills are shed. The operation is got through without an hour's waste of time. "I have known them" (Mr. Millais must speak for himself again) "all come out together in one day, the new flush starting at once."

The duck has others to think of besides herself. If she, like her mate, were to be deprived of flight-power, it would often be at the risk of her brood, and so her wing feathers are shed, like those of most birds, gradually, and she seldom, if ever, quite loses the use of her wings. If she has a second brood to look after, and is thus occupied later than usual with family cares, even this comparatively harmless wing moult is postponed for a more convenient season—as Mr. Millais believes, if we read him rightly—by a direct action of will on her part.

It is a wonderful story, but nothing in Nature is incredible merely because incomprehensible.

Mr. Millais has a very simple answer to a question which has puzzled many others than scientific naturalists. When ducks and other birds which usually nest on the ground change their habits, as they often do, and lay in trees, how do the young ones—*nidifugae* who leave the nest as soon as they are hatched—manage to get down?

At the mother's call, he says, they throw themselves down and alight unhurt. The explanation is good so far as it goes, and may, not improbably, be in most cases true. But it would be rash to accept it as of universal application.

Three young birds found dead at the foot of a tree in a park in Sussex led this spring to the discovery of a moorhen's nest at a very considerable height from the ground. The young birds were all well nourished and had been apparently killed by the fall.

Woodcocks have been more than once seen by trustworthy witnesses in the act of carrying their young, and there is no reason to suppose that ducks and other birds cannot on occasion as easily do the same.

There are many other directions in which, if space permitted, it would be pleasant to follow Mr. Millais's lead. But enough has, perhaps, been said already to show that his book is original and very interesting. The pictures are all excellent. Among the most interesting

is the pencil sketch by the author, facing p. 60, of the beak of a shoveller, with its strange spoonbill tip and the hanging bristles, in which—as in a sieve, or in the great mouth-fringes of the whalebone whale, to compare small things with large—dainty morsels are trapped as the bird skims the water as he paddles about with extended neck.

"Here" (the quotation is from the note attached to the sketch) "we see a wonderful provision of Nature. The comb-like teeth or *laminae* of the surface-feeding ducks are developed in proportion to the extent to which the particular species feed on the surface or otherwise. An omnivorous and somewhat coarse feeder like the mallard only possesses them in a very rudimentary form, whereas the shoveller, which is constantly skimming the surface for fine substances, has them greatly developed in both upper and lower mandibles."

Mr. Thorburn contributes eight full-sized coloured plates. He is still, among English bird-artists, an easy first. But in some of his pictures, notably Plates xxx. and xxxvii., garganeys chasing water-beetles, and the pintails, Mr. Millais has run him close.

The only fault to be found with a beautiful book is that in choosing his subjects for illustration the author has, perhaps, ridden his hobby "Eclipse" a little too hard.

The best work, excepting in the case of the few rare visitors figured, which are, strictly speaking, scarcely British, is confined almost entirely to birds in immature or transitional plumage. In a book of natural history, destined to take a well-earned place for some years to come as the standard work on our surface-feeding ducks, a few plates might with advantage have been spared, if only as a sop to unscientific bird-lovers, for ducks and drakes at their best.

T. DIGBY PIGOTT.

#### A FRENCH TEXT-BOOK OF ZOOLOGY.

*Traité de Zoologie Concrète.* Par Yves Delage et Edgard Hérouard. Tome ii., 2<sup>me</sup> Partie, Les Coelentérés. Pp. x + 848. (Paris: Libraire C. Reinwald, 1901.)

THE volumes of the "*Traité de Zoologie Concrète*" already published are so well known and have been so acceptable to zoologists that the present volume, dealing with the Coelenterata, scarcely requires any recommendation. While it leaves little to be desired in such important matters as abundance and excellence of illustrations, bibliography, index and glossary, the chief merit of the "*Traité de Zoologie Concrète*" must be attributed to the logical and systematic method of exposition adopted by its authors. The majority of zoological text-books, following the German model, give a brief and insufficient definition of each class or order of the animal kingdom, and this is succeeded by a discussion of the organology and embryology of the class or order that is generally so diffuse as to leave the student in a state of hopeless uncertainty as to what are the characteristic structural features of the group in question. Recognising the importance of fixing clear and definite ideas of structural relations in the student's mind, MM. Yves Delage and Hérouard have adopted the time-honoured plan of illustrating the anatomy of each important group of animals by a description of a morphological type, which

serves as a standard to which all the other members of the group may be referred. The method is familiar enough, but has fallen into discredit because previous authors have made too little use of it and have confined themselves to the description of one or two animals as examples of a large class, whence it has resulted that students have too frequently formed narrow conceptions of animal structure and have underestimated the wide range of variation of which animals belonging to the same class are capable. The "Traité de Zoologie Concrète" has the merit of having avoided this error by describing a morphological type, not only for each class or subclass, but also for each order, suborder, and even for each tribe. Thus a general description is given of the morphological type of the order Octanthida (Alcyonaria); *Kophobelemnion* is taken as a type of the suborder Pennatulidæ; *Renilla*, *Umbellula*, *Kophobelemnion*, *Pennatula* and *Gœndul* are taken as the morphological types of the five tribes into which the Pennatulidæ are divided, and a sufficient description of the families and genera included in the tribe follows the description of each type. This system is consistently adopted throughout the work, and as the types are illustrated by well-designed schematic drawings, the essential characters of all the subgroups are brought in the clearest possible manner before the mind.

The book gives evidence of a minute acquaintance with zoological literature, and the numerous illustrations are largely copied from treatises of a recent date. In the latter respect, the volume on the Cœlenterata is considerably in advance of other text-books, for it is only too frequently the case that old and sometimes obsolete illustrations are copied from book to book, while more recent work is ignored.

The classification adopted does not depart widely from accepted lines. The Cœlenterata are divided into two branches, Cnidarea and Ctenarea, the latter being co-extensive with the Ctenophora. Though some authors would separate the Ctenophora from the Cœlenterata on the ground that they have an embryonic mesoblast, MM. Delage and Hérourard give sufficient reasons for retaining them in the phylum in which they have so long been classed.

The Cnidarea are divided into two classes, Hydrozoaria and Scyphozozaria, the former including all the forms usually classed under Hydrozoa, except the Scyphozoa, which have been placed along with the Anthozoa in the class Scyphozozaria. The union of these two groups is a step in advance, abundantly justified by recent anatomical and embryological researches. In the class Hydrozoa it is noticeable that the Siphonophora are raised to the rank of a subclass, the other subclass, Hydrophora, including the Hydridæ, the Hydro-medusæ, the Trachymedusæ and Narcomedusæ. The grounds for this distinction are probably sufficient, but it is open to question whether the classification of the Siphonophora adopted in this work is an improvement on that of Hæckel, and one cannot but regret that the authors' love of symmetry or their anxiety to satisfy the claims of priority should have led them to abandon well-known and generally accepted names for others which are unfamiliar. For example, the order Chondrophorida sounds strange to most ears; the name is due to

Chamisso, but has never come into general use, and that of Disconectæ is preferable because better known. Again, in the Scyphozozaria the name Octanthidæ, derived from the Octactinia of Ehrenberg, is preferred to Alcyonaria, though the latter is in general use and there is no good reason for abandoning it. The name Actinanthidæ, again, is substituted for Zoantharia, without sufficient reason, and the classification of the order is open to many objections. It scarcely seems consistent to class Edwardsia and Tealia under the Hexactinidæ, though the authors justify the inclusion of the former genus because of Faurot's discovery of micromesenteries completing the first cycle of six pairs in certain species. The division of madreporarian corals into Hexacorallidæ and Tetracorallidæ is quite unjustifiable in the present state of our knowledge, and in spite of their sharp criticism of Miss Ogilvie's work on the microscopic characters of the corallum (p. 602), the authors might have given her the credit of having demonstrated the unity of structure in recent and so-called rugose or tetracorallid corals. Indeed, they are open to the charge of inconsistency in this respect, for they have borrowed largely from her figures and adopted her possibly erroneous views on the mode of formation of the corallum, but have refused to accept some of her most important and well-grounded conclusions. It is scarcely possible, at the present time, to retain the groups Aporina and Porina (*Aporosa* and *Perforata* of Milne-Edwards), though it must be confessed that no acceptable alternative has been offered, and MM. Delage and Hérourard, while retaining a discredited classification, give a very good summary of the various schemes that have been proposed by different authors.

Knowing the previous writings of M. Delage, one is not surprised to find that, in discussing the origin of atolls and barrier-reefs, he takes the opportunity of making a double attack on the Darwinian theories of the formation of coral reefs and natural selection. It is to be regretted that he allows himself to write so dogmatically on these subjects, for it is by no means the case that the theory of natural selection has been abandoned by zoologists in general as a "hypothèse séduisante," attractive but inadmissible. He would seem to have overlooked the school of statistical zoologists, whose work, so far as it has gone, has done much to strengthen the opinion that natural selection is by far the most potent factor in the evolution of species. Finally, when the complete results of the boring at Funafuti are published, M. Delage will probably be obliged to admit that the great English naturalist was not far wrong also in his speculations on the origin of atolls and barrier reefs.

G. C. BOURNE.

#### WAVES AND SOUND.

*Wellenlehre und Schall.* Von W. C. L. van Schaik. Translated into German by Dr. Hugo Fenkner. Pp. xi + 358. (Brunswick: F. Vieweg and Sohn, 1902.) Price Mk. 8.

NO portion of physics is more difficult to treat in an elementary way than that of sound; the consequence is that though advanced treatises of magnificent quality exist, an elementary text-book in English which